

frosts were issued for the extreme northwestern portion of the district on the 22d, 23d, and 26th, and for the northwestern portion on the 24th; but it was not certain that the weather would clear and in most cases these frost forecasts were not verified, though frost temperatures largely occurred. The forecast of the 14th for frost in the Texas Panhandle, contingent on clear weather, was verified. A forecast of freezing in the Texas Panhandle by the morning of November 1 was issued on October 30 and was verified.

Fire-weather warnings for forested regions in Oklahoma were issued on the 7th, and for Arkansas and Oklahoma on the 13th, and wind and weather occurred as forecast.—*R. A. Dyke.*

*San Francisco Forecast District.*—Killing frosts occurred in Nevada and eastern Oregon during the latter part of the first decade, and in northeastern Washington and Idaho during the second decade.

The following advisory and storm warnings were issued during the month:

1st, small-craft warnings were ordered at Washington coast and Sound stations 11 a. m., and changed to southwest storm warnings 6 p. m., at all Washington and Oregon stations.

3d, southwest storm warnings ordered 6:30 p. m., at the mouth of the Columbia River and Washington stations.

4th, southeast storm warnings ordered all Washington and Oregon stations 6:30 p. m.

5th, southeast storm warnings ordered Eureka to Mendocino 11:30 a. m., and at Point Reyes and San Francisco 4 p. m.

6th, all warnings ordered down 8 a. m.

10th, southwest storm warnings ordered 6 p. m., mouth of the Columbia River and Washington stations.

13th, southeast storm warnings ordered 11 a. m., all Washington and Oregon stations.

15th, southwest storm warnings ordered 6 p. m., Washington coast, and advisory warnings sent to other Washington and Oregon stations.

16th, southwest storm warnings ordered Puget Sound stations 7 a. m.

17th, southeast storm warnings ordered 8:30 a. m., all Washington and Oregon stations, and extended south to Eureka 6 p. m.

20th, advisory warnings issued 8 a. m., all Washington and Oregon stations.

24th, advisory warnings issued 8:30 a. m., all Washington and Oregon stations.

30th, advisory warnings issued 8:15 a. m., Port San Luis to San Diego, and small craft warnings ordered Straits of Fuca 11:30 a. m.—*G. H. Willson.*

## RIVERS AND FLOODS.

### FLOODS DURING OCTOBER.

By H. C. FRANKENFIELD, Meteorologist.

Heavy rains over northern New England caused a severe flood on October 4 in the Winooski River and other streams of northern Vermont, and considerable damage was done. The flood was said to have been the greatest since that of October 4, 1869.

A moderate flood, but without flood stages being reached, occurred over the lower Connecticut River early in the month on account of heavy rains over the valley, and advisory warnings were issued on the morning of October 1, a crest of 12.5 feet being forecast for Hartford, Conn., by October 2. A stage of 13.1 feet (flood stage, 16 feet) occurred at 9 p. m., October 2, the excess over the forecast stage having been caused by the giving way of a portion of the flash boarding on the Holyoke Dam, 32 miles above.

The Santee River was in moderate flood at the close of September and additional heavy rains on September 30 drove the river to a stage slightly in excess of the flood stage, Rimini and Ferguson, S. C., reporting stages of 12.9 and 12.4 feet, respectively (flood stage, 12 feet).

There were no losses, as the previous high water kept live stock from the swamps. There were no other floods east of the Mississippi River.

There were heavy rains over the Southwest during the early part of the third decade of the month, with resulting floods in some of the rivers of Oklahoma and Texas. There was a local flood in the Sulphur River of northwest Texas, with a crest stage of 22.6 feet, 2 feet above the flood stage, at Ringo Crossing. The river was above the flood stage for six days.

The North Fork of the Canadian River was in flood during the last week of the month, and the lower river remained so until November 8. Crest stages occurred as indicated in the second table following.

Warnings of the flood were first issued on October 22, and as often thereafter as occasion required, and, so far as is known, they were issued in ample time for farmers to protect themselves against loss. The greatest damage

was done in Oklahoma City, where the breaking of the levees resulted in the flooding of the low industrial and residential districts. No lives were lost.

The upper Trinity River of Texas was also in flood about the same time, although it subsided before the close of the month. Warnings were issued on October 24 and 25, one day in advance of the flood, and proved to be timely and accurate. Crest stages are given below. Losses were negligible, as the warnings enabled the removal of all stock from the overflowed lands before the arrival of the floods.

The Colorado River of Arizona was generally above the flood stage of 7 feet during the first three weeks of the month, with a maximum stage of 9.1 feet on October 3.

#### Estimated losses by floods.

River and district.	Farms, buildings, machinery, live stock, etc.	Suspension of business.	Value of warning.	Tangible property, roads, bridges, etc.	Crops matured.	Crops prospective.
North Canadian, Oklahoma, Okla.....	(1)	(1)	(1)	\$250,000	(2)	None.
Trinity, Dallas, Tex....	(2)	None.	(1)	(2)	(2)	None.

<sup>1</sup> Impossible to estimate.

<sup>2</sup> Negligible.

#### Flood stages during month of October, 1920.

River and station.	Flood stage	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
Atlantic Drainage:					
Susquehanna, Oneonta, N. Y.....	12	1	2	14.3	1
Santee: Rimini, S. C.....	12	1	5	12.9	3
Ferguson, S. C.....	12	2	9	12.4	5
Mississippi Drainage:					
North Canadian: Woodward, Okla.....	3	22	27	7.8	22
Canton, Okla.....	3	23	25	7.3	24
Oklahoma, Okla.....	12	20	(1)	13.3	30
Sulphur: Ringo Crossing, Tex.....	20	24	29	22.6	26
West Gulf Drainage:					
Trinity: Dallas, Tex.....	25	25	29	31.1	26
Colorado: Parker, Ariz.....	7	1	19	9.1	3

<sup>1</sup> Continued into November.